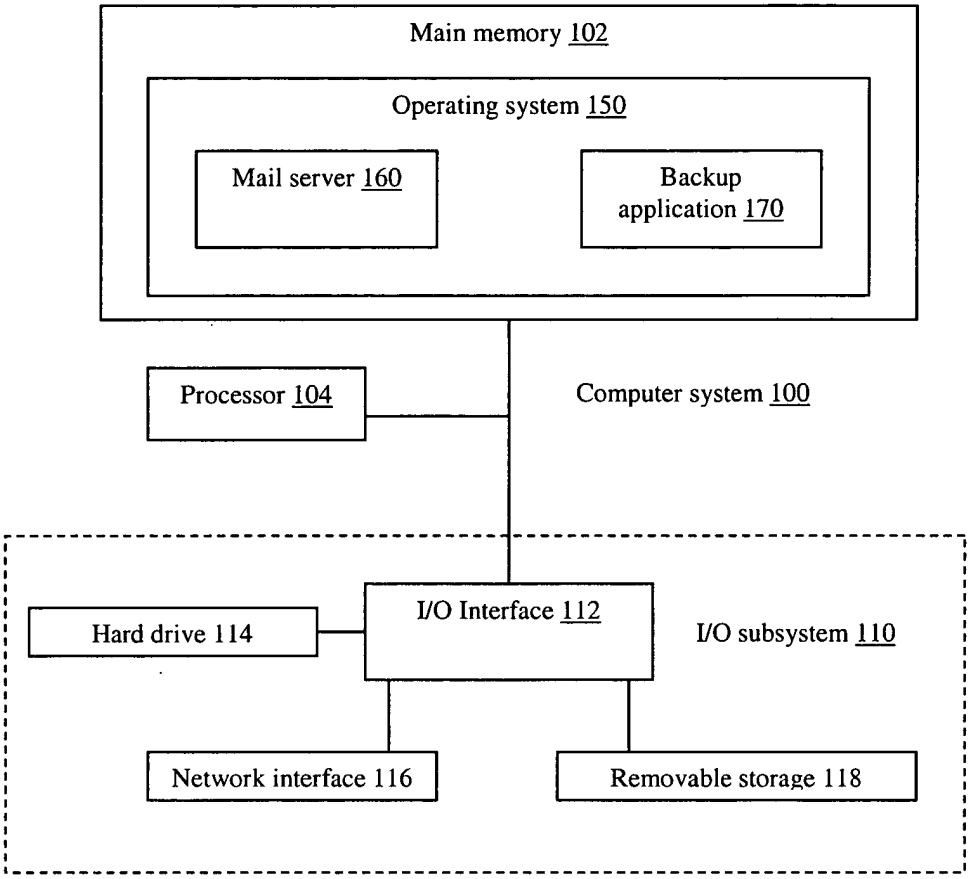

Main memory 102
Operating system 150
Mail server 160
Backup application 170
Processor 104
Computer system 100
Hard drive 114
I/O Interface 112
I/O subsystem 110
Network interface 116
Removable storage 118

Fig. 1

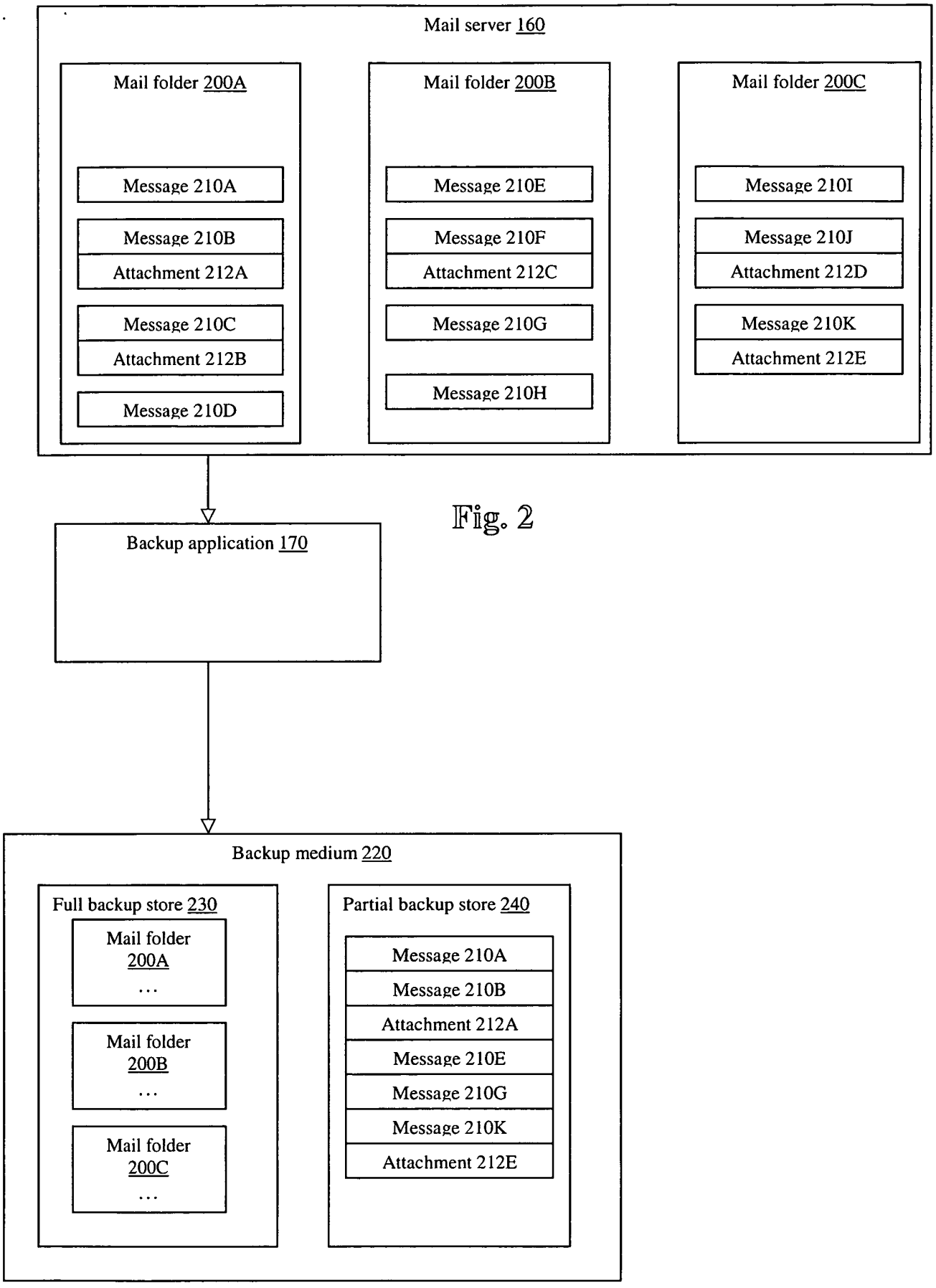
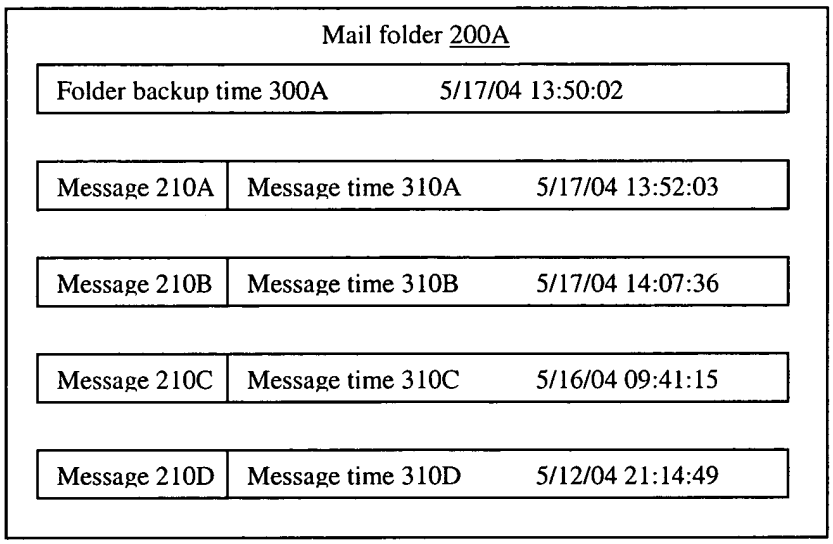

Mail server 160
Mail folder 200A
Message 210A
Message 210B
Attachment 212A
Message 210C
Attachment 212B
Message 210D
Mail folder 200B
Message 210E
Message 210F
Attachment 212C
Message 210G
Message 210H
Mail folder 200C
Message 210I
Message 210J
Attachment 212D
Message 210K
Attachment 212E
Backup application 170
Backup medium 220
Full backup store 230
Mail folder 200A
...
Mail folder 200B
...
Mail folder 200C
...
Partial backup store 240
Message 210A
Message 210B
Attachment 212A
Message 210E
Message 210G
Message 210K
Attachment 212E

Fig. 2

Fig. 3


Mail folder 200A
Folder backup time 300A 5/17/04 13:50:02
Message 210A
Message time 310A 5/17/04 13:52:03
Message 210B
Message time 310B 5/17/04 14:07:36
Message 210C
Message time 310C 5/16/04 09:41:15
Message 210D
Message time 310D 5/12/04 21:14:49

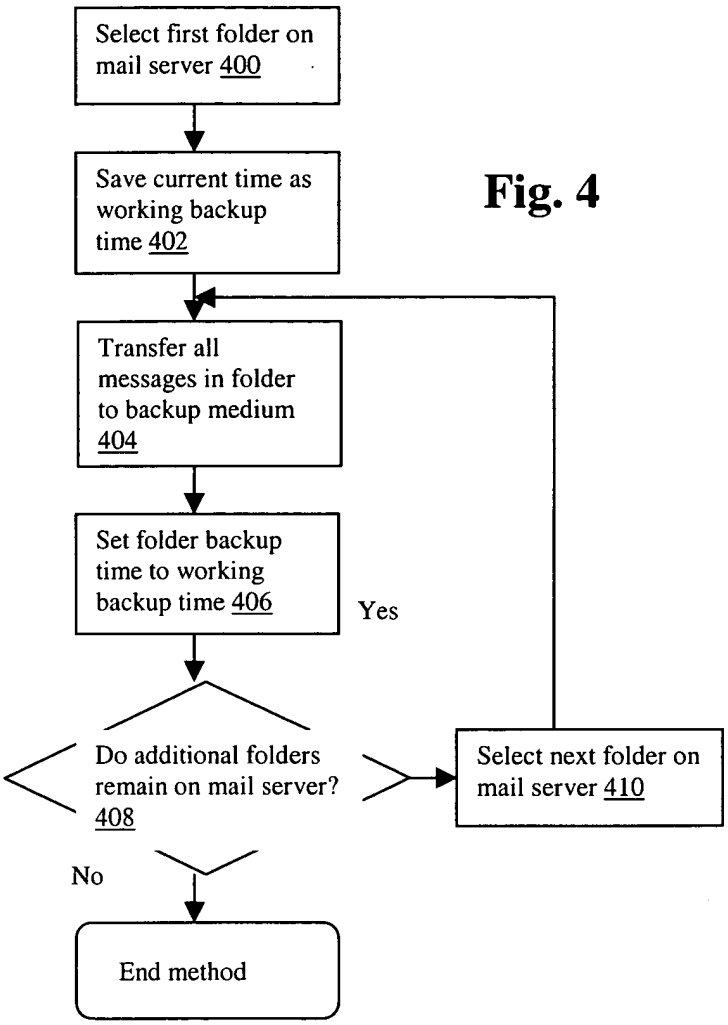

Select first folder on mail server 400
Save current time as working backup time 402
Transfer all messages in folder to backup medium 404
Set folder backup time to working backup time 406
Yes
Do additional folders remain on mail server? 408
Select next folder on mail server 410
No
End method

Fig. 4

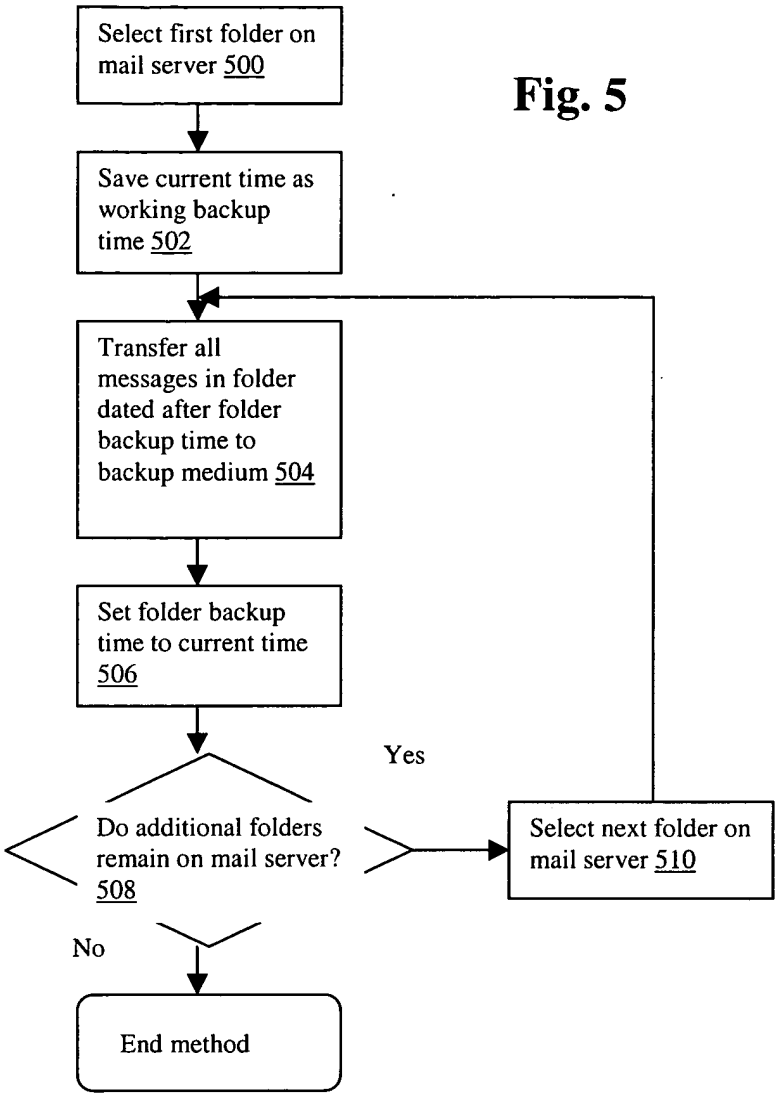
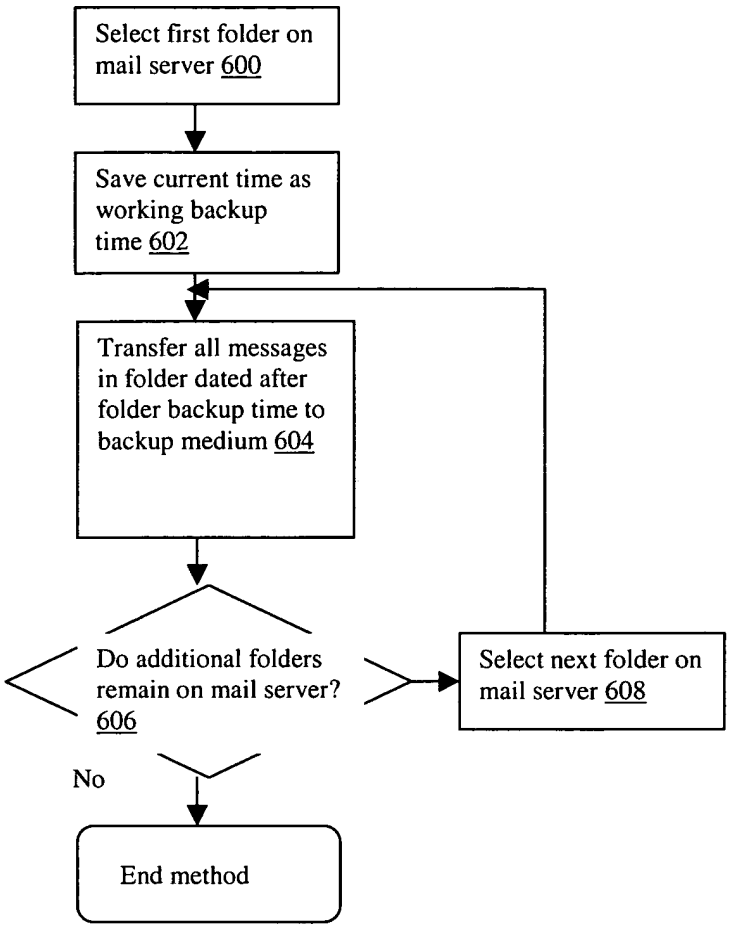

Select first folder on mail server 500
Save current time as working backup time 502
Transfer all messages in folder dated after folder backup time to backup medium 504
Set folder backup time to current time 506
Yes
Do additional folders remain on mail server? 508
Select next folder on mail server 510
No
End method

Fig. 5

Fig. 6


Select first folder on mail server 600
Save current time as working backup time 602
Transfer all messages in folder dated after folder backup time to backup medium 604
Do additional folders remain on mail server? 606
Select next folder on mail server 608
No
End method

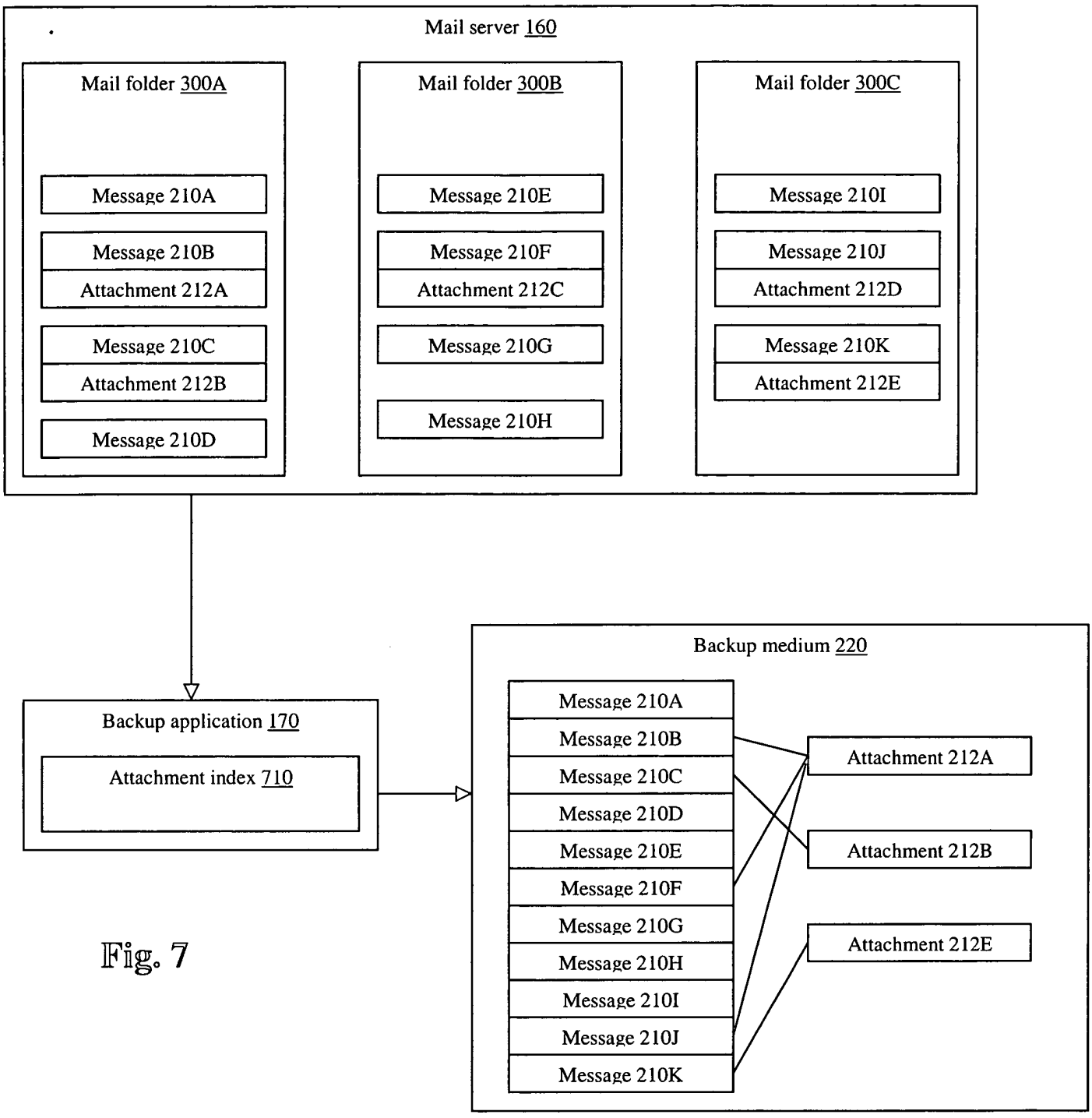

Mail server 160
Mail folder 300A
Message 210A
Message 210B
Attachment 212A
Message 210C
Attachment 212B
Message 210D
Mail folder 300B
Message 210E
Message 210F
Attachment 212C
Message 210G
Message 210H
Mail folder 300C
Message 210I
Message 210J
Attachment 212D
Message 210K
Attachment 212E
Backup application 170
Attachment index 710
Backup medium 220
Message 210A
Message 210B
Message 210C
Message 210D
Message 210E
Message 210F
Message 210G
Message 210H
Message 210I
Message 210J
Message 210K
Attachment 212A
Attachment 212B
Attachment 212E

Fig. 7

Fig. 8

Mail folder 200A

Message 210B	Message time 310B	5/17/04 14:07:36
Attachment 212A	Record number 812A	56

Message 210C	Message time 310C	5/16/04 09:41:15
Attachment 212B	Record number 812B	59

Mail folder 200B

Message 210F	Message time 310F	5/17/04 14:07:36
Attachment 212C	Record number 812C	56

Mail folder 200C

Message 210J	Message time 310J	5/17/04 14:07:36
Attachment 212D	Record number 812A	56

Message 210K	Message time 310K	5/15/04 17:22:57
Attachment 212E	Record number 812E	61

Attachment index 710

Message 212A	Message time	5/17/04 14:07:36	Record number 56	Mail folder ID 200A, 200B, 200C
Message 212B	Message time	5/16/04 09:41:15	Record number 59	Mail folder ID 200A
Message 212E	Message time	5/15/04 17:22:57	Record number 61	Mail folder ID 200C

Fig. 9

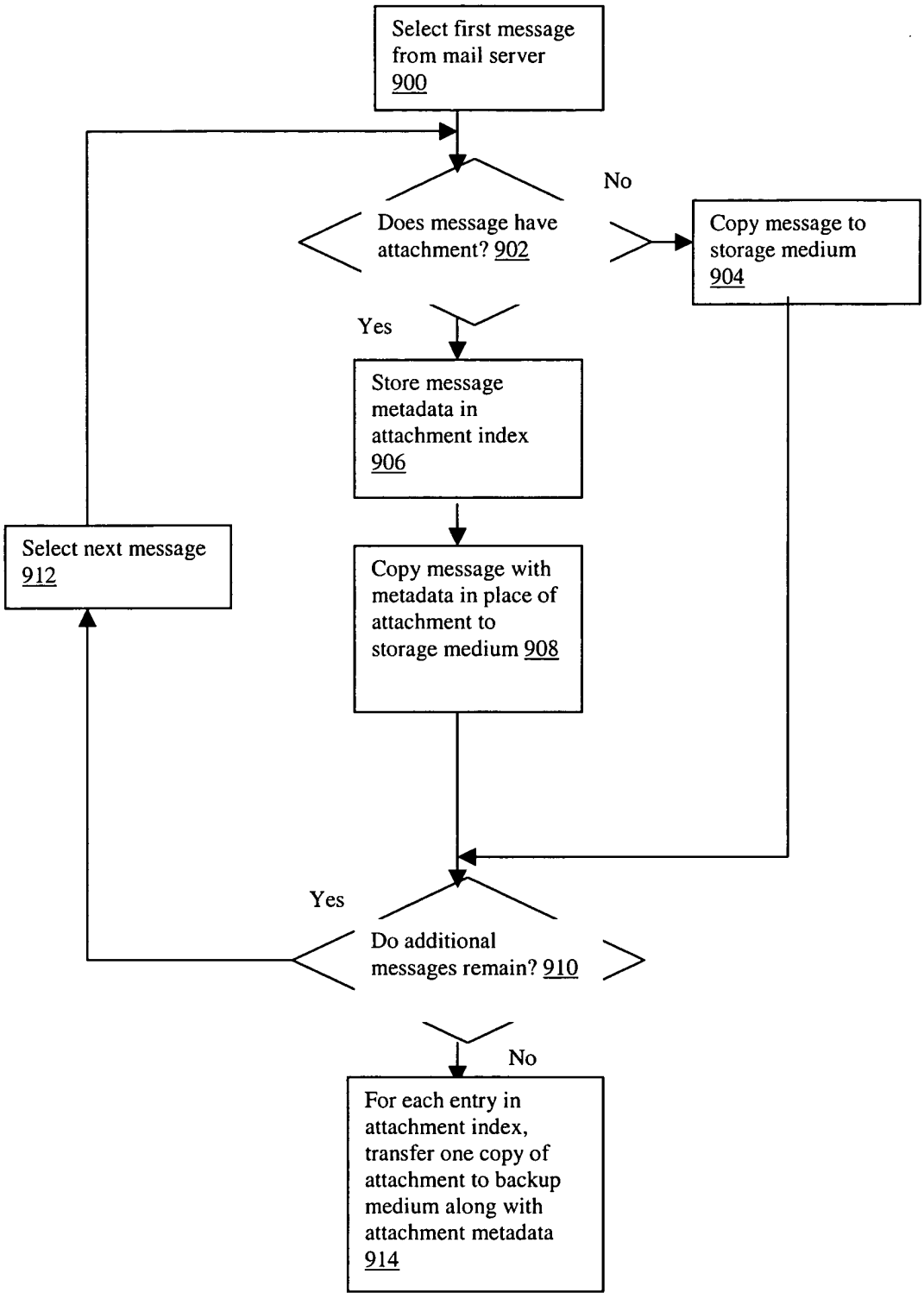
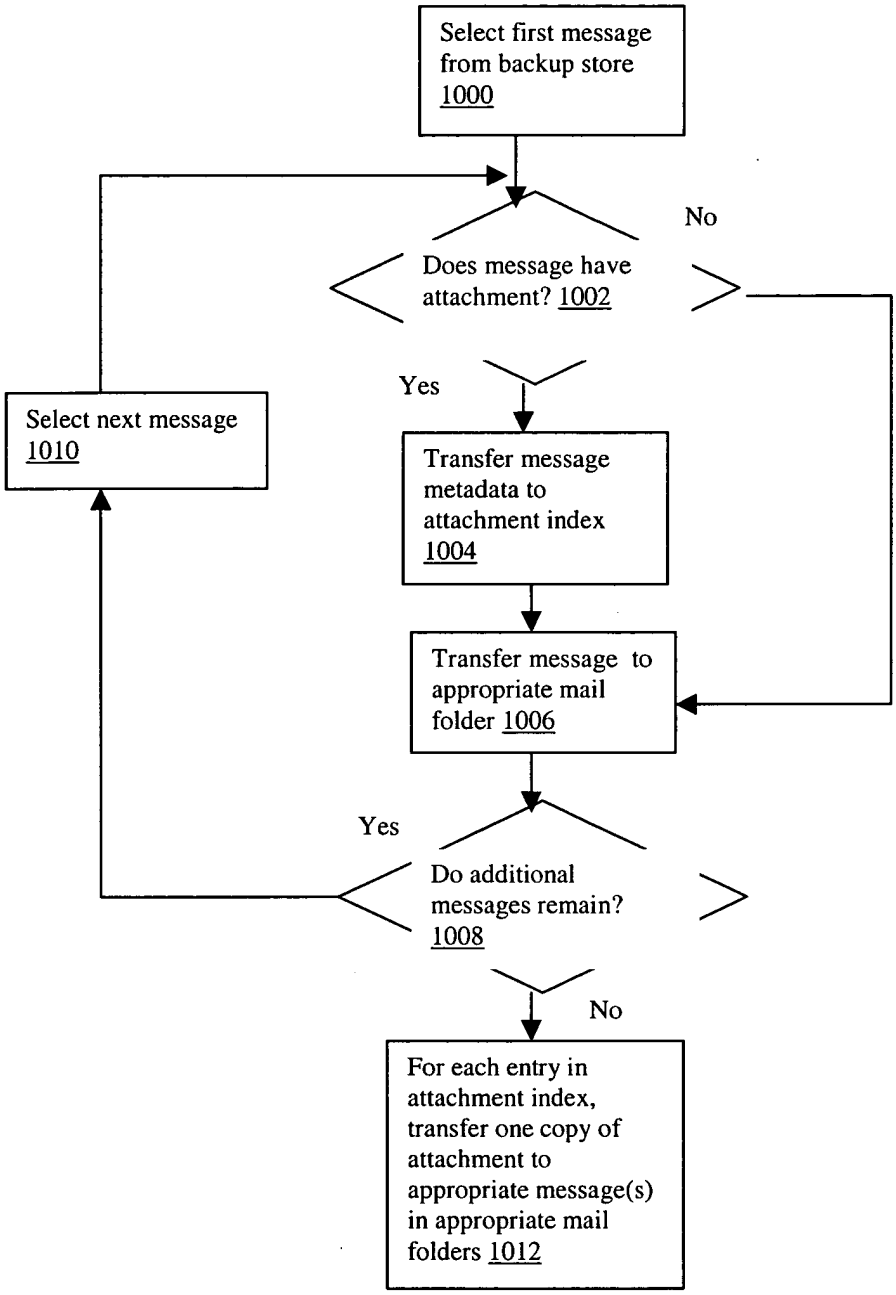

Select first message from mail server 900
Does message have attachment? 902
No
Copy message to storage medium 904
Yes
Store message metadata in attachment index 906
Copy message with metadata in place of attachment to storage medium 908
Select next message 912
Yes
Do additional messages remain? 910
No
For each entry in attachment index, transfer one copy of attachment to backup medium along with attachment metadata 914

Fig. 10


Select first message from backup store 1000
Does message have attachment? 1002
No
Yes
Transfer message metadata to attachment index 1004
Transfer message to appropriate mail folder 1006
Do additional messages remain? 1008
Yes
No
Select next message 1010
For each entry in attachment index, transfer one copy of attachment to appropriate message(s) in appropriate mail folders 1012